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Forest Cover Data of
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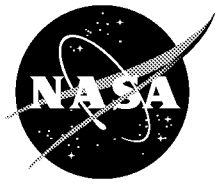

Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall, Editor

Volume 112

SERM Forest Cover Data of Saskatchewan in Vector Format

Jaime Nickeson, Raytheon ITSS, NASA Goddard Space Flight Center, Greenbelt, Maryland
Fern Gruszka, Saskatchewan Environment and Resource Management (SERM), Prince Albert, SK, Canada

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

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SERM Forest Cover Data of Saskatchewan in Vector Format

Jaime Nickeson, Fern Gruszka

Summary

This data set was acquired as a general provincial scale vegetation cover map and an alternative to the very detailed vector forest cover data available for the BOREAS SSA. The data set was prepared by SERM-FBIU, and is a condensed forest cover type map of Saskatchewan at a scale of 1:1,000,000. The date of the maps from which this data set was generated is unknown; it is estimated that the forest cover maps were made in the mid-1980s.

Note that some of the files of this data set on the BOREAS CD-ROMs have been compressed using the Gzip program. See Section 8.2 for details.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

SERM Forest Cover Data of Saskatchewan in Vector Format

1.2 Data Set Introduction

The condensed forest cover type digital map of Saskatchewan is a product of the Saskatchewan Environment and Resource Management, Forestry Branch - Inventory Unit (SERM-FBIU). This map was generalized from SERM township maps of vegetation cover at an approximate scale of 1:63,000 (1 in. = 1 mile). The cover information was iteratively generalized until it was compiled on a 1:1,000,000-scale map base.

1.3 Objective/Purpose

These data are provided as part of the BOReal Ecosystem-Atmosphere Study (BOREAS) Staff Science Geographic Information System (GIS) Data Collection Programs, which included the collection of all pertinent map data in the BOREAS area of interest in both hardcopy and digital form. This data set was acquired as a general provincial scale vegetation cover map and an alternative to the very detailed vector forest cover data available for the Southern Study Area (SSA).

1.4 Summary of Parameters

There are just two items associated with each forest cover type polygon in this data set. Forest class (merchantable, nonmerchantable, other) and forest type. There are four merchantable and nonmerchantable forest cover types and 10 types within the "other" forest class.

1.5 Discussion

The forest cover type data set of Saskatchewan at a scale of 1:1,000,000 provided by SERM-FBIU is a generalized cover map of the forested region of the province. Little is known about this data set. It has not been documented by SERM personnel, and they have since informed BOREAS staff of a data set that has been produced more recently that should have a higher level of accuracy and precision. Contact SERM directly regarding the updated product (Section 2.3).

1.6 Related Data Sets

SERM Forest Cover Data Layers of the SSA in Vector Format
BOREAS Forest Cover Data Layers over the SSA in Raster Format
BOREAS Forest Cover Data Layers of the NSA in Raster Format
Prince Albert National Park Forest Cover Data in Vector Form

2. Investigator(s)

2.1 Investigator(s) Name and Title

BOREAS Staff Science

2.2 Title of Investigation

BOREAS Staff Science GIS Data Collection Program

2.3 Contact Information

Contact 1:

Fern Gruszka
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CANADA S6V 6G1
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gruszka@larix.derm.gov.sk.ca

Contact 2:

Jaime Nickeson
Raytheon ITSS
Code 923
NASA GSFC
Greenbelt, MD 20771
(301) 286-3373
(301) 286-0239 (fax)
Jaime.Nickeson@gsfc.nasa.gov

3. Theory of Measurements

SERM-FBIU maintains in its inventory unit a GIS of forest inventory information for Saskatchewan forested lands. This inventory is maintained primarily for use by forest managers for silvicultural purposes and it contains a wealth of information that can be of use in Earth resources analyses and ecosystem modeling. This map was produced as a generalization of this inventory.

4. Equipment

4.1 Sensor/Instrument Description

No information is known about the original digitizing equipment or procedures and criteria used in the digitizing process, other than what is provided above.

4.1.1 Collection Environment

Unknown.

4.1.2 Source/Platform

Unknown.

4.1.3 Source/Platform Mission Objectives

Unknown.

4.1.4 Key Variables

Forest Cover Type

4.1.5 Principles of Operation

Unknown.

4.1.6 Sensor/Instrument Measurement Geometry

Unknown.

4.1.7 Manufacturer of Sensor/Instrument

Unknown.

4.2 Calibration

4.2.1 Specifications

Unknown.

4.2.1.1 Tolerance

Unknown.

4.2.2 Frequency of Calibration

Unknown.

4.2.3 Other Calibration Information

None.

5. Data Acquisition Methods

The forest cover type data set of Saskatchewan at a scale of 1:1,000,000 provided by SERM-FBIU is a generalized cover map of the forested region of the province. The map was generalized from SERM township maps of vegetation cover at an approximate scale of 1:63,000 (1 in. = 1 mile) in the Lambert Polyconic projection. The information was iteratively generalized until it was compiled on a 1:1,000,000-scale map base, of unknown projection. Little detail is known about this data set, and SERM has stated "[we] cannot overstate how dated and imprecise this product is." Nevertheless, the data set is being made available because within BOREAS there are needs for coarse-scale information.

6. Observations

6.1 Data Notes

Unknown.

6.2 Field Notes

Unknown.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

This data set covers the forested portion of the province of Saskatchewan. In ARC/INFO when you DESCRIBE the coverage, this is what you will get:

```
                    COVERAGE BOUNDARY
Xmin =          7.479          Xmax =         30.013
Ymin =          5.105          Ymax =         27.117
```

The BOREAS Information System (BORIS) staff does not know what these units are, but guesses that they might be inches from the digitizing table and that real-world coordinates were never entered for this data set. On the hardcopy map of the data, it is apparent that the borders on the east and west are the Saskatchewan provincial boundaries. The northern and southern boundaries are 57 and 52 degrees latitude, respectively. The corners are given below; the Southeast corner coordinate was approximated.

	Longitude (degrees)	Latitude (degrees)
Northwest	110	57
Northwest	102	57
Southwest	110	52
Southeast	101.6	52

7.1.2 Spatial Coverage Map

Not available.

7.1.3 Spatial Resolution

This is a very coarse and imprecise data set with limited available information associated with it. At a scale of 1:1,000,000, gridding the data to a raster cell size of 1,000 m x ,1000 m would seem appropriate.

7.1.4 Projection

The actual projection is unknown. A best guess would be that it is Lambert Conformal Conic under the North American Datum of 1927 (NAD27). If one wishes to PROJECTDEFINE this coverage in ARC/INFO, the following information would be useful:

```
NAD27 CNT
1st standard parallel: 50 degrees 50 minutes
2nd standard parallel: 58 degrees 10 minutes
Central Meridian: 115 degrees
Latitude of projection's origin: 0 0 0
False Easting (meters): 0.0
False Northing (meters): 0.0
```

Our sources at SERM indicate that one could rubber sheet it to almost any projection and it would not be significantly less accurate.

7.1.5 Grid Description

Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage

Most of the data used for this product were acquired by BORIS in 1993. The forest cover type data set of Saskatchewan at a scale of 1:1,000,000 provided by SERM-FBIU is a generalized cover map of the forested region of the province. This data set has not been documented by SERM, and little detail is known about it, including creation date, other than the comment that it was created "many years ago." SERM has informed BOREAS staff of a data set that has been produced more recently that should have a higher level of accuracy and precision. Contact SERM directly regarding the acquisition of an updated forest cover type product (Section 2.3).

7.2.2 Temporal Coverage Map

Not available.

7.2.3 Temporal Resolution

The original maps (1:12,500) are completely reinventoried by SERM personnel on a 10- to 20-year cycle, except for disturbed areas, which are updated annually. The date of the maps this data set was generated from is unknown. BOREAS staff's best guess is that it was generated from forest cover maps made in the mid-1980s. One could possibly try to determine the approximate year by the evidence or lack thereof for significant known fires.

7.3 Data Characteristics

7.3.1 Parameter/Variable

Polygon features with attributes. Each polygon has a CLASS and TYPE item associated with it in addition to relative spatial information.

7.3.2 Variable Description/Definition

- forest cover class - described as either merchantable, unmerchantable, or other
- forest cover type - for merchantable and unmerchantable the type is one of the following:
    - softwood jackpine
    - softwood spruce
    - hardwood
    - mixedwood

7.3.3 Unit of Measurement
None.

7.3.4 Data Source
The original data were acquired as ARC/INFO coverages or export files from:

Saskatchewan Environment and Resource Management
Forestry Branch - Inventory Unit
800 Central Ave.
Prince Albert, Saskatchewan
Canada S6V 6G1

7.3.5 Data Range
Not applicable.

7.4 Sample Data Record
Not applicable.

8. Data Organization

8.1 Data Granularity
The smallest amount of obtainable data is the complete data set.

8.2 Data Format(s)

8.2.1 Uncompressed Data Files
The product consists of three files on tape. Each of the files contains 80-byte American Standard Code for Information Interchange (ASCII) text records blocked to a multiple of 80.

The files were written with the dd commands:

```
dd if=README.1ST of=/dev/tape_device ibs=80 obs=80 cbs=80 conv=block
dd if=PAT.DOC of=/dev/tape_device ibs=80 obs=800 cbs=80 conv=block
dd if=fcov_1M.e00 of=/dev/tape_device ibs=80 obs=8000 cbs=80 conv=block
```

The files can easily be retrieved using dd in a similar manner:

```
dd if=/dev/tape_device of=readme ibs=80 obs=80 cbs=80 conv=unblock
dd if=/dev/tape_device of=PAT.doc ibs=800 obs=80 cbs=80 conv=unblock
dd if=/dev/tape_device of=fcov_1M.e00 ibs=8000 obs=80 cbs=80 conv=unblock
```

- File 1 is a README file describing the data. It contains 27 records of 80 bytes.
- File 2 is the Polygon Attribute Table (PAT) file associated with the polygon coverages. It contains 313 records ranging in size from 560 to 800 bytes. Each record larger than 80 bytes contains sets of 80 byte logical records blocked together.
- File 3 is the ARC/INFO export file. It contains 1,078 records ranging in size from 1,280 to 8,000 bytes. Each record larger than 80 bytes contains sets of 80-byte records blocked together.

8.2.2 Compressed CD-ROM Files
On the BOREAS CD-ROMs, files 1 and 2 are stored as ASCII text. File 3 has been compressed with the Gzip compression program (file name *.gz). These data have been compressed using gzip version 1.2.4 and the high compression (-9) option (Copyright (C) 1992-1993 Jean-loup Gailly). Gzip

(GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP programs. The compressed files may be uncompressed using gzip (-d option) or gunzip. Gzip is available from many Web sites (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

9. Data Manipulations

9.1 Formulae
None.

9.1.1 Derivation Techniques and Algorithms
None.

9.2 Data Processing Sequence

9.2.1 Processing Steps
BORIS staff copied the ASCII and compressed the binary files for release on CD-ROM.

9.2.2 Processing Changes
None.

9.3 Calculations

9.3.1 Special Corrections/Adjustments
Unknown.

9.3.2 Calculated Variables
None.

9.4 Graphs and Plots
None.

10. Errors

10.1 Sources of Error
This data set is old and of questionable accuracy, as stated in Section 5. SERM wants to make sure that all who use this data set are well aware of this fact.

10.2 Quality Assessment

10.2.1 Data Validation by Source
Unknown.

10.2.2 Confidence Level/Accuracy Judgment
This data set is old and of questionable accuracy, as stated in Section 5. SERM wants to make sure that all who use this data set are well aware of this fact.

10.2.3 Measurement Error for Parameters
Both spatial and forest type information can be considered of questionable accuracy.

10.2.4 Additional Quality Assessments

None.

10.2.5 Data Verification by Data Center

BORIS staff displayed the data and no anomalies were noticed.

11. Notes

11.1 Limitations of the Data

This data set is old and of questionable accuracy, as stated in Section 5. SERM wants to make sure that all who use this data set are well aware of this fact. Both spatial and forest type information can be considered of questionable accuracy.

11.2 Known Problems with the Data

None.

11.3 Usage Guidance

Saskatchewan Parks and Renewable Resources does not accept any liability for decisions/action taken on the basis of these data. This data set is old and of questionable accuracy, as stated in Section 5. SERM wants to make sure that all who use this data set are well aware of this fact.

Before uncompressing the Gzip files on CD-ROM, be sure that you have enough disk space to hold the uncompressed data files. Then use the appropriate decompression program provided on the CD-ROM for your specific system.

11.4 Other Relevant Information

SERM-FBIU has informed BOREAS staff of a data set that has been produced more recently that should have a higher level of accuracy and precision. Contact SERM directly regarding the updated product (Section 2.3).

12. Application of the Data Set

This data set could provide reference information at a rough scale for assessing Advanced Very High Resolution Radiometer (AVHRR)-Leaf Area Coverage (LAC) or Global Area Coverage (GAC) classifications over the area and serve as an initial baseline data set for analyzing land cover and vegetation change.

13. Future Modifications and Plans

None given.

14. Software

14.1 Software Description

The Environmental Systems Research Institute, Inc. (ESRI) ARC/INFO GIS package was used to produce the data set. Questions about the software should be directed to:

Environmental Systems Research Institute, Inc.
380 New York Street
Redlands, CA 92373-8100

Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP commands.

14.2 Software Access

ARC/INFO is a commercial package; contact ESRI for details.

Gzip is available from many Web sites across the Internet (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

15. Data Access

The SERM forest cover data of Saskatchewan in vector format are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information

For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification

Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics http://www-eosdis.ornl.gov/.

15.3 Procedures for Obtaining Data

Users may obtain data directly through the ORNL DAAC online search and order system [http://www-eosdis.ornl.gov/] and the anonymous FTP site [ftp://www-eosdis.ornl.gov/data/] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans

The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.

16. Output Products and Availability

16.1 Tape Products

The data can be made available on 8-mm, Digital Archive Tape (DAT), or 9-track tapes at 1600 or 6250 BPI.

16.2 Film Products

None available from BORIS. See Other Relevant Information, Section 11.4.

16.3 Other Products

These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation

Welch, T.A. 1984. A Technique for High Performance Data Compression. IEEE Computer, Vol. 17, No. 6, pp. 8-19.

17.2 Journal Articles and Study Reports

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. 2000. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM.

Sellers, P. and F. Hall. 1994. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1994-3.0, NASA BOREAS Report (EXPLAN 94).

Sellers, P. and F. Hall. 1996. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1996-2.0, NASA BOREAS Report (EXPLAN 96).

Sellers, P., F. Hall, and K.F. Huemmrich. 1996. Boreal Ecosystem-Atmosphere Study: 1994 Operations. NASA BOREAS Report (OPS DOC 94).

Sellers, P., F. Hall, and K.F. Huemmrich. 1997. Boreal Ecosystem-Atmosphere Study: 1996 Operations. NASA BOREAS Report (OPS DOC 96).

Sellers, P., F. Hall, H. Margolis, B. Kelly, D. Baldocchi, G. den Hartog, J. Cihlar, M.G. Ryan, B. Goodison, P. Crill, K.J. Ranson, D. Lettenmaier, and D.E. Wickland. 1995. The boreal ecosystem-atmosphere study (BOREAS): an overview and early results from the 1994 field year. Bulletin of the American Meteorological Society. 76(9):1549-1577.

Sellers, P.J., F.G. Hall, R.D. Kelly, A. Black, D. Baldocchi, J. Berry, M. Ryan, K.J. Ranson, P.M. Crill, D.P. Lettenmaier, H. Margolis, J. Cihlar, J. Newcomer, D. Fitzjarrald, P.G. Jarvis, S.T. Gower, D. Halliwell, D. Williams, B. Goodison, D.E. Wickland, and F.E. Guertin. 1997. BOREAS in 1997: Experiment Overview, Scientific Results and Future Directions. Journal of Geophysical Research 102 (D24): 28,731-28,770.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None.

19. List of Acronyms

AVHRR - Advanced Very High Resolution Radiometer
BOREAS - BOReal Ecosystem-Atmosphere Study
BORIS - BOREAS Information System
DAAC - Distributed Active Archive Center
EOS - Earth Observing System
EOSDIS - EOS Data and Information System
GAC - Global Area Coverage
GIS - Geographic Information System
GSFC - Goddard Space Flight Center
LAC - Local Area Coverage
NAD27 - North American Datum of 1927
NASA - National Aeronautics and Space Administration
NSA - Northern Study Area
ORNL - Oak Ridge National Laboratory
PANP - Prince Albert National Park
PAT - Polygon Attribute Table
SERM - Saskatchewan Environment and Resource Management
SSA - Southern Study Area
URL - Uniform Resource Locator

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20.2 Document Review Dates

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When using these data, please include the following acknowledgment as well as citations of relevant papers in Section 17.2:

The author(s) thank Fern Gruszka (SERM-FBIU) for providing the data to the BOREAS Information System.

If using data from the BOREAS CD-ROM series, also reference the data as:

BOREAS Staff Science, "BOREAS Staff Science GIS Data Collection Program." In Collected Data of The Boreal Ecosystem-Atmosphere Study. Eds. J. Newcomer, D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers. CD-ROM. NASA, 2000.

Also, cite the BOREAS CD-ROM set as:

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13. ABSTRACT *(Maximum 200 words)*

This data set was acquired as a general provincial scale vegetation cover map and an alternative to the very detailed vector forest cover data available for the BOREAS SSA. The data set was prepared by SERM-FBIU, and is a condensed forest cover type map of Saskatchewan at a scale of 1:1,000,000. The date of the maps from which this data set was generated is unknown; it is estimated that the forest cover maps were made in the mid-1980s.

14. SUBJECT TERMS
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